



Mini-Circuits

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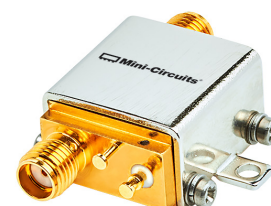
Low Noise Amplifier

ZX60-10133LN+

50 Ω 10 to 13 GHz SMA Female

KEY FEATURES

- Low noise figure, 1.2 dB typ.
- High gain, 14.7 dB typ.
- Extremely low gain flatness, ± 0.37 dB typ.
- High output IP3, +28.3 dBm typ.
- Voltage regulated internally and reverse voltage protected
- Ideal evaluation module for [PMA2-133LN+](#)

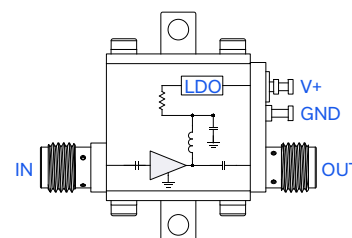


Generic photo used for illustration purposes only

APPLICATIONS

- Ku-band SATCOM
- Test and measurement equipment
- Radar, EW, and ECM defense systems
- Backhaul radio systems
- Signal distribution networks

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' ZX60-10133LN+ is a low noise amplifier utilizing MCL's own E-pHEMT-based ultra-low noise MMIC amplifier, the [PMA2-133LN+](#). Operating from 10 to 13 GHz, the model offers a unique combination of low current consumption, low noise and high IP3, making it ideal for sensitive, high-dynamic-range receiver applications. This design operates on a single +6 V supply at 40 mA and comes in a rugged, compact unibody case (0.74x0.75x0.46") with integrated SMA female connectors, making it an excellent candidate for demanding operating conditions and crowded system layouts.

ELECTRICAL SPECIFICATIONS AT +25 °C BASEPLATE AND $V_s = +6$ V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Frequency Range		10		13	GHz
Gain	10.0	12.5	14.6		dB
	10.7		14.4		
	11.0		14.4		
	12.0		14.9		
	13.0		15.1		
Gain Flatness	10-13		± 0.37		dB
Input Return Loss	10.0		16.9		dB
	10.7		14.4		
	11.0		13.4		
	12.0		14.0		
	13.0		31.6		
Output Return Loss	10.0		13.3		dB
	10.7		10.2		
	11.0		10.1		
	12.0		14.6		
	13.0		13.8		
Directivity	10-13		8.6		dB

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ELECTRICAL SPECIFICATIONS AT +25 °C BASEPLATE AND $V_s = +6$ V, UNLESS NOTED OTHERWISE

Parameter	Condition (GHz)	Min.	Typ.	Max.	Units
Output Power at 1 dB Compression (P_{1dB})	10.0		+14.3		dBm
	10.7		+14.3		
	11.0		+13.9		
	12.0		+11.0		
	13.0		+9.4		
Output Third Order Intercept Point (Output Power = -10 dBm/Tone)	10.0		+28.3		dBm
	10.7		+28.5		
	11.0		+28.4		
	12.0		+28.3		
	13.0		+27.9		
Noise Figure	10.0		1.1	1.9	dB
	10.7		1.2		
	11.0		1.2		
	12.0		1.3		
	13.0		1.4		
DC Supply Voltage (V_s)		+5.5	+6	+12	V
DC Current ¹			40	50	mA

1. Typical current measured under small signal conditions.



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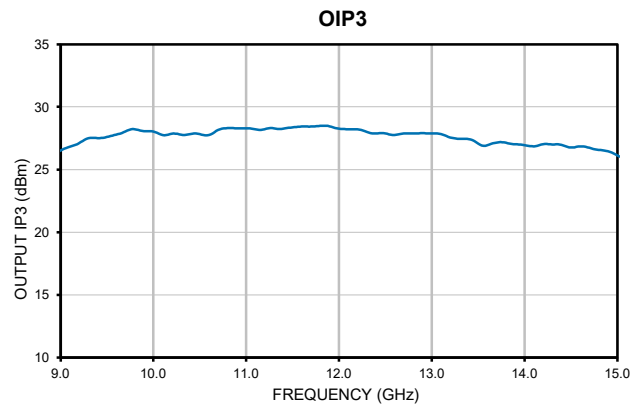
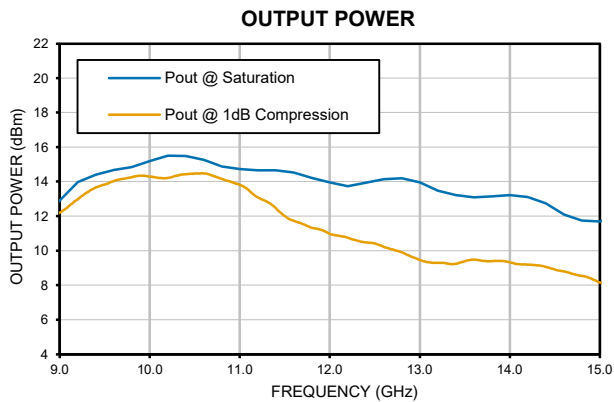
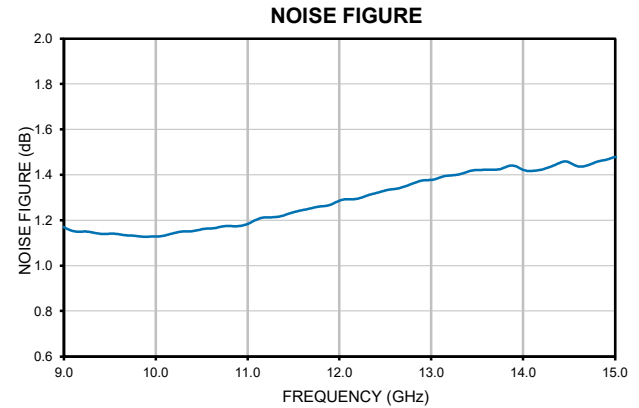
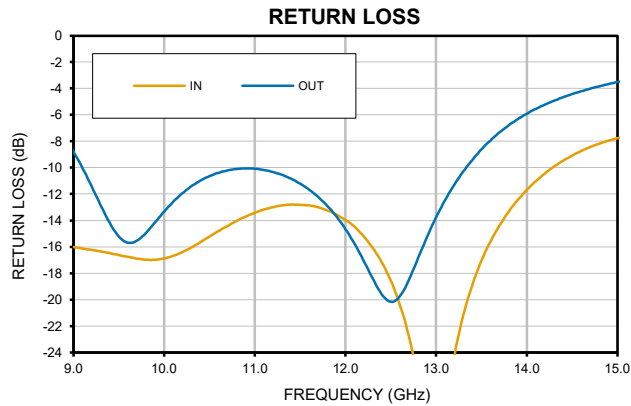
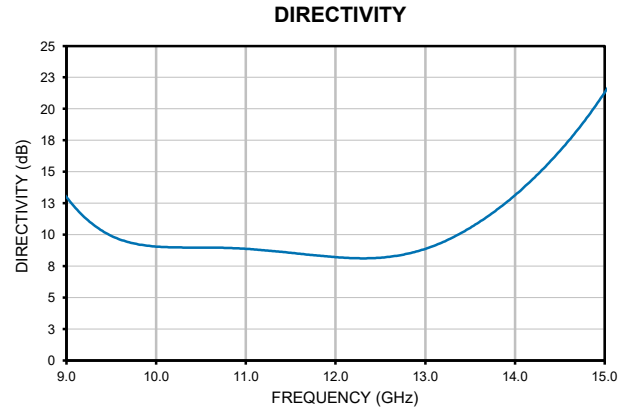
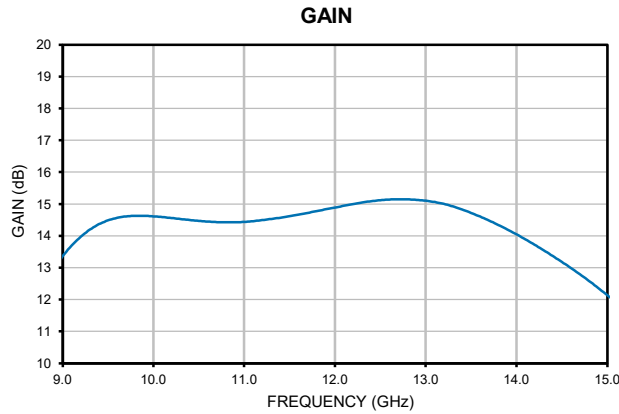
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Low Noise Amplifier

ZX60-10133LN+

50Ω 10 to 13 GHz SMA Female

TYPICAL PERFORMANCE GRAPHS



ABSOLUTE MAXIMUM RATINGS^{2,3}

Parameter	Ratings
Operating Temperature (Case)	-40 °C to +85 °C
Storage Temperature	-55 °C to +100 °C
Total Power Dissipation ⁴	0.76 W
RF Input Power (CW)	+10 dBm
DC Operating Voltage	+15 V

2. Specified under matched load to 50Ω.

3. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.

4. Total power dissipation determined at $V_s = +15$ V with the amplifier operating in max DC current conditions.

DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEATSINK

$\text{MAXIMUM THERMAL RESISTANCE} = \frac{\text{MAXIMUM OPERATING CASE TEMP} - \text{MAXIMUM USER AMBIENT TEMP}}{\text{POWER DISSIPATION}}$	
Example:	MAXIMUM OPERATING CASE TEMP = +50 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +30 °C (USER DEFINED) POWER DISSIPATION = 10 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = (+50 °C - +30 °C) / 10 W = 2 °C/W



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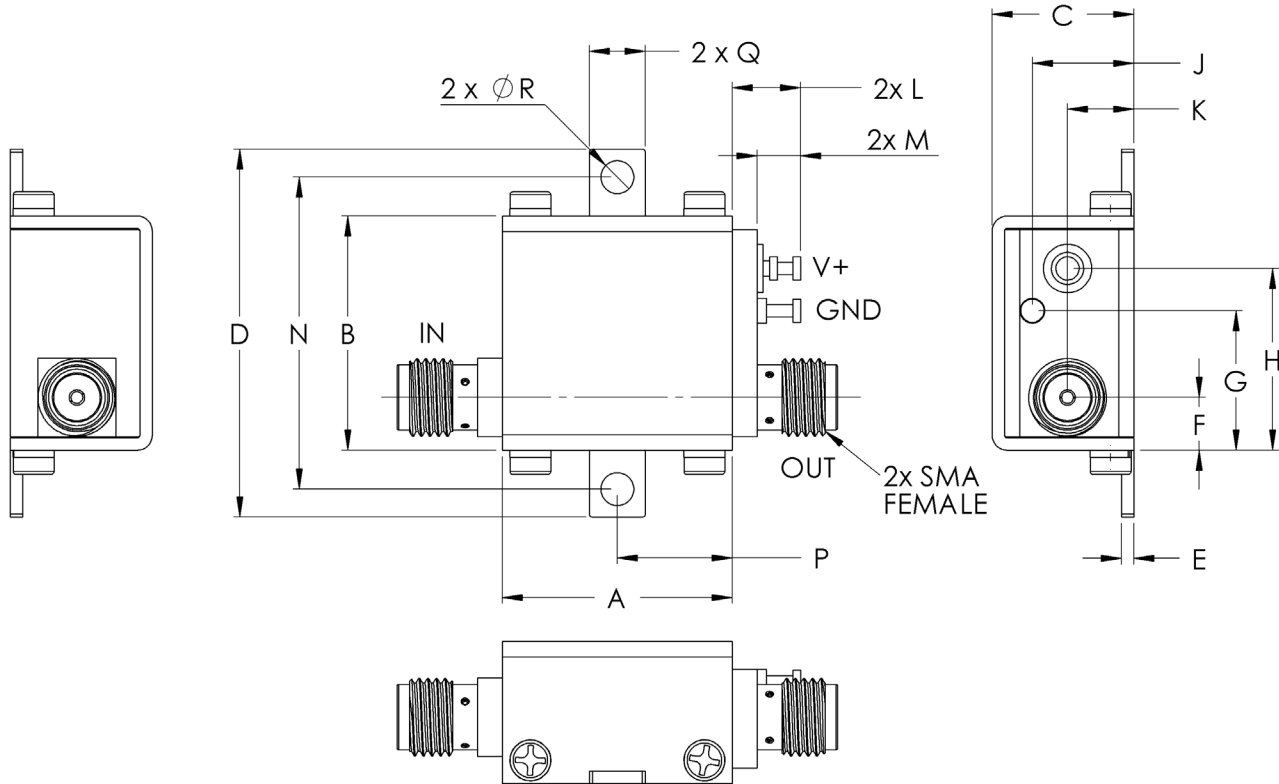
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Low Noise Amplifier

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50Ω 10 to 13 GHz SMA Female

CASE STYLE DRAWING



Weight: 23.0 grams

Dimensions are in inches [mm]. Tolerances: 1 Pl. ± 0.1 ; 2 Pl. ± 0.03 ; 3 Pl. ± 0.015 Inches

 NOTE: When soldering the DC connections, caution must be used to avoid overheating the DC terminal. See Application Note [AN-40-010](#)

OUTLINE DIMENSIONS (Inches mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	wt
.74	.75	.46	1.18	.04	.17	.45	.59	.33	.21	.22	.14	1.00	.37	.18	.106	grams
18.80	19.15	11.61	30.07	1.02	4.32	11.40	14.86	8.31	5.44	5.59	3.56	25.4	9.40	4.57	2.69	23.0





ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

Performance Data & Graphs	Data
	Graphs
	S-Parameter (S2P Files) Data Set (.zip file)
RoHS Status	Compliant
Environmental Ratings	ENV23T10
Export Information	ECCN# EAR99

ORDERING INFORMATION

Model No. Link	ZX60-10133LN+
Case Style	GC957
Connector	IN: SMA Female OUT: SMA Female

NOTES

- A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuits' applicable established test performance criteria and measurement instructions.
- C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/terms/viewterm.html

Coaxial Amplifier

ZX60-10133LN+

Typical Performance Data

FREQUENCY	GAIN	DIRECTIVITY	RETURN LOSS (dB)		Pout @ 1 dB COMPRESSION	NOISE FIGURE	OIP3
(GHz)	(dB)	(dB)	IN	OUT	(dBm)	(dB)	dBm
9.0	13.35	12.98	16.01	8.78	12.2	1.2	26.44
9.2	13.97	11.39	16.23	11.42	13.0	1.2	27.17
9.4	14.36	10.29	16.48	14.19	13.7	1.1	27.78
9.6	14.56	9.60	16.76	15.69	14.0	1.1	28.07
9.8	14.63	9.23	16.97	14.94	14.3	1.1	28.45
10.0	14.61	9.05	16.87	13.33	14.3	1.1	28.25
10.2	14.56	8.98	16.40	11.95	14.2	1.1	28.26
10.4	14.50	8.97	15.65	10.98	14.4	1.2	27.68
10.6	14.45	8.96	14.81	10.39	14.5	1.2	27.79
10.8	14.42	8.94	14.03	10.10	14.2	1.2	28.52
11.0	14.44	8.87	13.42	10.08	13.8	1.2	28.22
11.2	14.49	8.75	13.00	10.33	13.1	1.2	28.30
11.4	14.57	8.62	12.80	10.84	12.5	1.2	28.46
11.6	14.67	8.48	12.86	11.67	11.7	1.2	28.83
11.8	14.78	8.33	13.24	12.89	11.3	1.3	29.02
12.0	14.89	8.21	13.97	14.65	11.0	1.3	28.24
12.2	15.00	8.12	15.21	17.04	10.7	1.3	28.48
12.4	15.09	8.12	17.18	19.59	10.5	1.3	27.68
12.6	15.14	8.23	20.41	19.75	10.2	1.3	27.78
12.8	15.14	8.48	25.95	16.88	9.9	1.4	28.01
13.0	15.10	8.87	31.31	13.76	9.5	1.4	27.84
13.2	15.00	9.41	24.32	11.30	9.3	1.4	27.24
13.4	14.83	10.12	18.88	9.40	9.2	1.4	27.24
13.6	14.60	10.98	15.59	7.93	9.5	1.4	26.75
13.8	14.34	11.98	13.34	6.80	9.4	1.4	26.86
14.0	14.05	13.12	11.69	5.91	9.3	1.4	26.49
14.2	13.72	14.42	10.44	5.22	9.2	1.4	27.00
14.4	13.37	15.86	9.48	4.67	9.1	1.5	26.75
14.6	12.99	17.47	8.74	4.21	8.8	1.4	26.74
14.8	12.58	19.27	8.18	3.84	8.5	1.5	26.43
15.0	12.14	21.29	7.78	3.51	8.2	1.5	25.70



ISO 9001 ISO 14001 AS 9100 CERTIFIED

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IF/RF MICROWAVE COMPONENTS

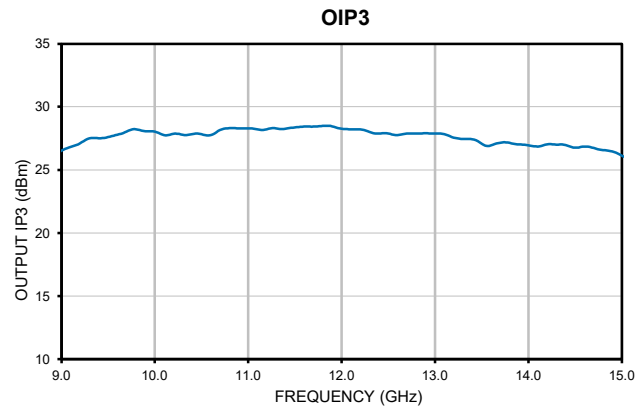
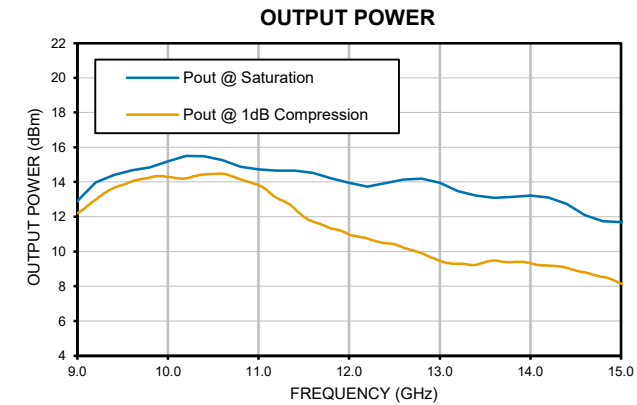
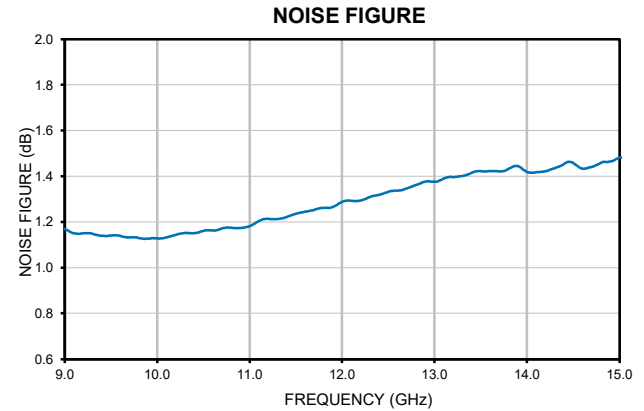
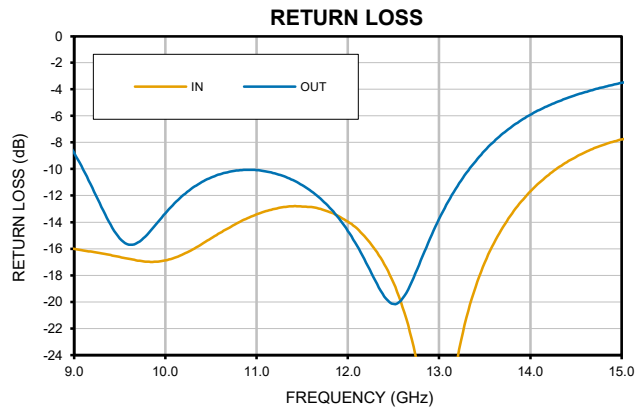
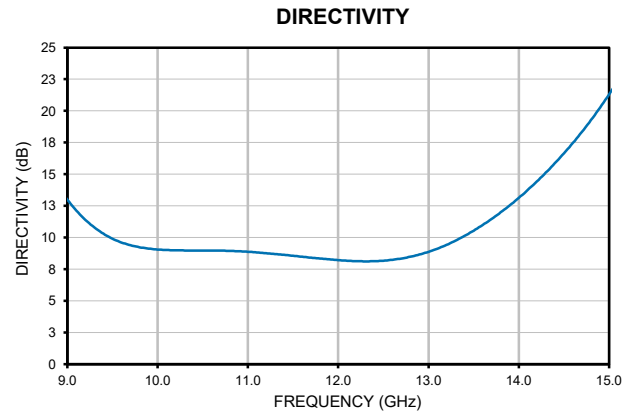
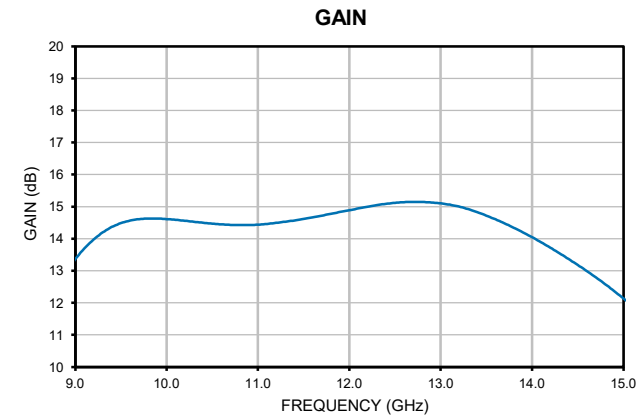


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 ZX60-10133LN+
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Coaxial Amplifier

ZX60-10133LN+

Typical Performance Curves

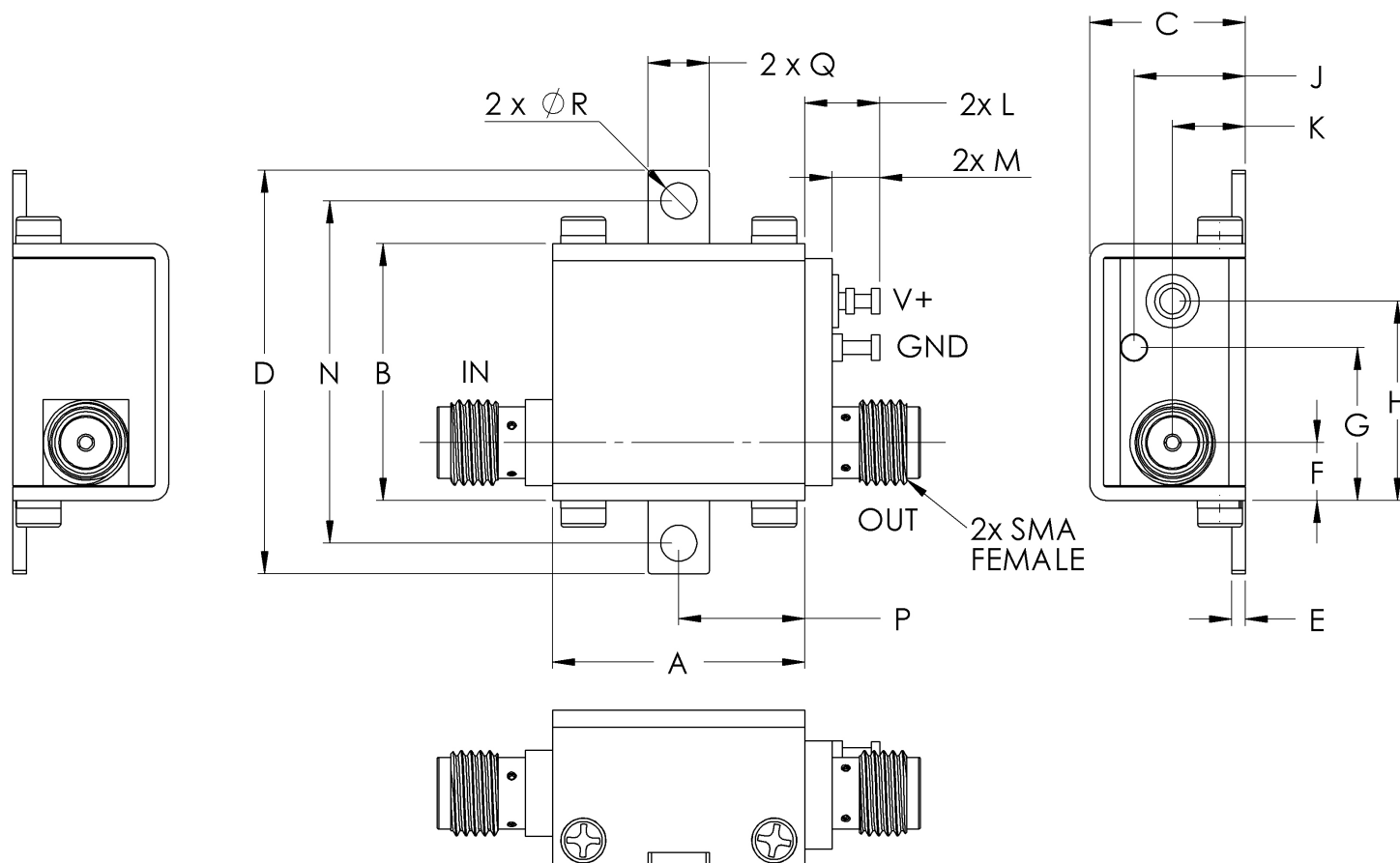


Case Style

Outline Dimensions

GC

GC957



CASE #.	A	B	C	D	E	F	G	H	J	K	L	M	N
GC957	.74 (18.80)	.75 (19.15)	.46 (11.61)	1.18 (30.07)	.04 (1.02)	.17 (4.32)	.45 (11.40)	.59 (14.86)	.33 (8.31)	.21 (5.44)	.22 (5.59)	.14 (3.56)	1.00 (25.4)

CASE #.	P	Q	R	WT GRAMS
GC957	.37 (9.40)	.18 (4.57)	.106 (2.69)	23.0

Dimensions are in inches (mm). Tolerances: 2Pl. $\pm .03$; 3Pl. $\pm .015$
Tolerance on hole size and interaxes dimensions to be $\pm .005$.

Note:

1. Case material: Brass
2. Case finish: Nickel plate

Mini-Circuits®

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All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-40° to 85° C Case Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Stabilization Bake	(non-operating) 125°C, 24 hours	- - -
Burn-in at Elevated Temp.	(DC on) 160 hours at 85° C	MIL-STD-202, Method 108
Thermal Shock	-55° to 100°C, 5 cycles	MIL-STD-202, Method 107, Condition A, except 100°C